

STATE OF MICHIGAN PUBLIC TRANSPORTATION



SMALL BUS SPECIFICATIONS

**18 Passenger Nonlift bus - Lift bus with Alternate Seating
90" INTERIOR WIDTH**

1999-2001



**Bureau of Urban and Public Transportation
Passenger Transportation Division**

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SPECIFICATIONS

STATE OF MICHIGAN PUBLIC TRANSPORTATION

18-PASSENGER NON-LIFT SMALL BUS AND LIFT BUS WITH ALTERNATE SEATING 90" INTERIOR WIDTH

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**SPECIFICATIONS
STATE OF MICHIGAN**

**18-PASSENGER NON-LIFT SMALL BUS
AND LIFT BUS WITH ALTERNATE SEATING
90" INTERIOR WIDTH**

I. PURPOSE OF SPECIFICATIONS

The purpose of these specifications is to set forth the minimum requirements for a two-axle, light transit class commercial non-lift bus or Paratransit type commercial bus equipped with a commercial wheelchair lift, with the body mounted on a commercial or recreational vehicle (RV) chassis. The small bus capable of seating 18 adult forward facing passengers and alternate capacity of ambulatory adult passengers and wheelchair passengers shall have been fully tested at the Penn State bus test facility in Altoona, Pennsylvania to Federal Transit Administration [FTA] minimum service life category of 4-years/100,000 miles which typically is light-duty small buses, cutaways, or modified vans, 16-28 feet in length. As a minimum, vehicles must meet all applicable Michigan Motor Carrier Vehicle Codes, all applicable Federal Motor Vehicle Safety Standards (FMVSS) and the Americans with Disabilities Act (ADA). Any successful bidder supplying these vehicles shall quick title and deliver the vehicle and the title to the location specified by the state of Michigan, Bureau of Urban and Public Transportation. Chassis serial number, body serial number, axle ratio, gross vehicle weight rating (GVWR), seating capacity and paint codes shall be imprinted on a permanent decal or stamped on a metal plate and affixed in the driver's area of the vehicle (location to be approved by the State). The bidder shall have a facility(ies) and personnel in Michigan or may subcontract with a prime Michigan firm(s) capable of handling final inspection and corrections required by the State prior to acceptance of the vehicles. Service facilities shall be established throughout the state for providing service support to transit agencies at a maximum of 100 miles of agency travel to reach the nearest facility. The bidder must also be capable of providing in-field warranty service at the service facility or transit location or at a facility mutually agreed upon by the transit agency and the successful bidder. Warranty shall become effective on the date the vehicle is placed into service based upon agency notice to contractor. Warranty service performed at the manufacturer's facilities at the manufacturer's request shall have all costs covered by the manufacturer. Successful bidder must be capable of providing parts and service for a period of seven years after the vehicles has been placed in service throughout the state of Michigan. Successful bidder must be able to supply available parts within 5 working days of request by transit agency unless bidder notifies transit agency that the part is not available for shipment.

Regardless of options and seating plan ordered, the successful bidder shall be responsible for certifying that all vehicles delivered: 1) shall not exceed 95% of front spring and 95% of rear spring capacity rating at ground without exceeding gross vehicle weight rating (GVWR) of chassis as bid (determined by engineering calculated loaded vehicle axle weights): and 2) buses with a single wheelchair securement area shall not exceed 21' 11" in length measured bumper to bumper excluding the energy absorbing portion of the bumper. Manufacturers shall comply with chassis company Quality Vehicle Manufacturing (QVM) standards.

In these specifications any required approvals shall be made by the State. Wherever brand, manufacturer, or product names are used, they are included only for the purpose of establishing a description of minimum quality of the item. This inclusion is not to be construed as advocating or prescribing the use of any particular brand or item or product. When an approved equal is requested, the

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bidder must demonstrate the quality of its product to the State, and must furnish sufficient technical data, test results, and the like, to enable the state to determine whether the bidder's product is or is not equal to that specified. All requests for approved equals must be submitted with the bid and will be considered when bid evaluations are made.

II. BODY SPECIFICATIONS

A. General Design and Construction

SAFETY: The chassis and body shall be designed using only prudent, proven engineering principles with all work performed only by professional established firms. The vehicle purchased shall comply with all state regulations and requirements applicable to the design and manufacture of motor vehicles.

DRIVER SIZE and COMFORT: Design criteria of bus purchased shall be for all females from the 5th percentile, to males of the 95th percentile, to be equally as comfortable in using all controls required to safely drive and maneuver the bus. All driver controls shall comply with FMVSS 101, with hand and foot controls required to operate the vehicle safely, including the placement of exterior adjustable mirrors, positioned to meet this safety requirement.

QUALITY of WORKMANSHIP: All labor employed in both the manufacturing and assembly processes of the vehicle purchased shall be to the highest industry standards. The entire vehicle shall be within all established engineering tolerances set by all parties involved in the design and production of the bus. All added components shall be installed and positioned according to the component manufacturer's installation procedures (available upon request).

WELDING: All welding procedures used throughout the construction of the vehicle, including materials, qualifications and training of personnel, shall be in accordance with the standards of the American Society for Testing and Materials (ASTM) and the American Welding Society (AWS). Contact surfaces of all material to be welded shall be clean, and free of grease, paint, rust and scale. After welding, all rough edges and surfaces on parts shall be ground smooth and coated with a corrosion inhibiting primer and paint.

ATTACHMENT HARDWARE: All rivets, screws, bolts, nuts, washers and / or other types of fasteners used in the construction process shall be of appropriate size and strength rating for the application, and sprayed with or dipped in a rust-resistant coating material, or be cadmium or zinc plated, or be stainless steel, or otherwise be made of rust-resistant type material all of which will pass the 1000 hour ASTM D117 Salt Spray test and the 1000 hour ASTM D2247 Humidity Resistance test.

B. Body Structure and Exterior Panels

1. Metal Rollover Frame, Cage-type Construction

- a. The coach shall have a heavy-duty unit body-type structure. The body structure (rollover frame, cage type) shall be of durable steel or aluminum construction and adequately reinforced at all joints and points of stress, with sufficient strength to comply with the FMVSS 220 rollover protection test. All body and floor structural members (tubes, channels, etc.) shall be Gas Metal Arc Welded (GMAC) or equal at each joint. Each bidder shall provide certification with the bid that the vehicle, as bid, meets the FMVSS 220 rollover protection test (see Section VIII).

- b. The bus shall be designed to withstand road shocks, stop and start operations, and other conditions found in Michigan transit bus service. The body shall be securely fastened to the chassis frame structure using a method of uniform attachment to the chassis frame so that the entire body and frame shall act as one unit without any movement in joining. Roof, side, front, and back panels shall be secured to the floor structure and body vertical and horizontal frame members to result in a permanent, fully-integrated structural unit adequately reinforced with posts and rails at all points where stress concentration may occur. The body floor subframe assembly, including lower skirt reinforcements, shall be gage number 14 (.075" thickness) minimum galvanized steel (mill applied), stainless steel, aluminum, or cold or hot rolled steel with zinc chromate coating, each of which shall have equal mechanical and corrosion resistance properties as gage number 14 galvanized steel as a minimum. The entire body cage and frame including floor structure shall be coated with corrosion resistant primer and paint (steel) or properly treated to resist corrosion (other materials). All box type tubing used in the floor structure shall have the interior of the tube coated with corrosion resistant material equal to Ziebart Type A. All components treated to resist corrosion shall be properly cleaned to remove greases, oils, and residues before application of the corrosion resistant material. When completed all body side sections and roof sections including structure shall be at a minimum 1¼" thick. Where body segments are joined they shall be properly sealed to prevent intrusion of drafts, fumes, dust, and water to the interior of the bus body.
- c. All exterior side and roof panel material shall be gage number 25-24 (.019"-.024" thickness) galvanealed steel or metal of equal mechanical properties, minimum. The corners, transitions, front panels, and other locations requiring additional strength shall use steel or other metal with mechanical properties to match the structural integrity requirements. If fiberglass it shall have as a minimum the mechanical properties equal to gage number 25-24 (.019"-.024" thickness) steel according to ASME industry standards and must have State approval. Reinforcements shall be installed around all window openings in order to transfer stress around the opening. All door openings shall have full structural framing (tube) or imbedded reinforcements equal to the structural members of the body that will adequately support concentrations of stress around openings. Where a stiffener or a backer material (substrate) is used for the exterior panels, it shall be bonded with waterproof adhesive to the exterior panel; it shall be a water resistant material; and it must be thoroughly sealed from the elements when installed so that the substrate will not be exposed to or absorb moisture and cause corrosion to the interior of the panel or any body structure. Exterior panel substrate shall not be of wood composition, plywood or a pressed wood product.
- d. All interior panels may be made of scuff-resistant vinyl-coated aluminum, textured paint on steel, or laminate/FRP finished material. Interior panels shall have as a minimum the physical properties of gage number 24 (.024" thickness) vinyl-coated aluminum. Interior panel threaded fasteners or rivets shall secure panels to body framing structure. Where fasteners are in the panels only, a reinforcing nut or reinforcing panel shall be

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installed for added strength and fastener retention.

- e. Exterior panels and lower skirt panels may be metal or fiberglass and shall be sufficiently stiff to prevent vibration, drumming, or flexing while the bus is in normal service. Body front and/or rear endcaps may be molded fiberglass panels installed with required structural framing or a FRP composite structure. Highly corrosion resistant metal lower-skirt panels shall consist of compatible materials not subject to electrolysis and shall be sufficiently fastened and braced to prevent damage from ice and snow build-up. Metal lower skirt panels shall be properly coated to resist corrosion (exterior and interior), see Section II., Part M., Undercoating. Lower skirt panels may be one piece in length and shall be repairable in sections. Lower skirt panels shall not use a wood substrate material for a panel stiffener. Where exterior panels are lapped, the upper or forward panels shall act as a watershed. Exterior panels that are cut shall have the cut edge sealed (paint or special sealing compound). Sealing and fastening of panel joints, including front and rear cap-to-body joints, shall prevent entrance of moisture and dirt. Joint sealing shall be made through use of a non-shrinking bonding sealant and sealing shall not be solely dependent on an exterior trim strip or a trim cap for the seal. All exterior panels shall be buck riveted and/or bonded to the body frame structure. Exterior metal panels shall be given a thorough anti-corrosion treatment.
- f. The outside body panels shall have on each side one heavy-duty rubrail. Rubrails shall be extruded solid aluminum with a flexible, rubber-type resilient material insert (minimum $1\frac{1}{2}$ " x $\frac{1}{2}$ ") or $1\frac{1}{2}$ " x $\frac{1}{2}$ " minimum solid rubber-type of flexible, resilient material. Rubrails shall be located no less than 25" nor more than 36" above the ground on each side. Rubber fender splash guards shall be installed on front and rear wheel openings. Where the rubrails and fender opening guards are not an integral part of the body, installation of rubrails and fender opening splash guards shall be made after the finish coat of paint is applied to the bus.
- g. Gun installed huckbolt fastenings, buck rivets, bonding adhesives, or approved equivalent shall be utilized on all exterior body panels, rubrails, and all other locations where stress is concentrated. Where huckbolts cannot be used, all nuts, bolts, washers, clamps, and like fasteners on the exterior and interior of the unit shall be properly plated to resist corrosion. No sheet metal screws shall be permitted, except for rubrails and rubber fender splash guards which can be secured with plated locking-type, self-tapping bolts. Fastener materials shall be compatible with materials being fastened. Where self-tapping bolts are used, body panels shall be reinforced with steel backing, aluminum backing, or stainless steel backing. In no case shall the sealing of the panels be dependent on caulking alone.
- h. Window openings cut into body panels shall have a maximum total clearance of **C**" around frame ($1/16$ " on each side) to minimize the need for caulking (see Section II. V., Windows Item 1). All openings cut into metal body exterior panels must have the exposed cut edges primed or properly coated to inhibit water intrusion and corrosion before further assembly or painting occurs.

2. Fiberglass Reinforced Plastic (FRP) Composite Unitized-type Body

- a. The coach body shall have a heavy-duty unitized structure and shall be of durable fiberglass reinforced plastic (FRP) composite construction. The body panels shall consist of an exterior high gloss gelcoat (.020" thickness, minimum) on a resin-hardened FRP (3/16" thickness, minimum) attached to a center layer of resin hardened Verticel® or equal honeycomb (¾" thickness, minimum) with an inner FRP panel (3/16" thickness, minimum); or may be ¾" polyurethane foam insulation gelcoated to ¼" FRP exterior with ¼" FRP interior, reinforced with steel perimeter and transverse supports, completely fiberglassed to adjoining body parts. It shall be adequately bonded and mechanically fastened at all joints and points of stress with sufficient strength to comply with the FMVSS 220 rollover protection test. Each bidder shall provide certification with the bid that the vehicle as bid meets the FMVSS 220 rollover protection test (see Section VIII).
- b. The bus shall be designed to withstand road shocks, stop and start operations, and other conditions found in Michigan transit bus service. The body shall be securely fastened to the chassis frame structure using a method of uniform attachment to the chassis frame so that the entire body and frame shall act as one unit without any movement in joining. Side and back panels shall be secured to the floor and lower body frame members; all of which shall result in a permanent, fully-integrated structural unit adequately reinforced at all points where stress concentration may occur. The body floor subframe assembly, including lower skirt reinforcements, shall be gage number 14 (.075" thickness) minimum galvanized steel (mill applied), stainless steel, aluminum, or cold or hot rolled steel with zinc chromate coating, each of which shall have equal mechanical and corrosion resistance properties as gage number 14 galvanized steel or spray coating treated steel as a minimum. The entire lower body frame shall be coated with corrosion resistant primer/paint (steel) or properly treated to resist corrosion (other materials). All treated components shall be properly cleaned to remove greases, oils, and residues before application of the corrosion resistant material. The vehicle shall adequately carry loads for which it was designed without exceeding its GVWR.
- c. All exterior side and roof panels when completed shall be at a minimum 1¼" thick. The side walls, rear endcap, roof, and front cap shall be interlocked by resin saturated fiberglass matting and mechanical fasteners, forming a unibody design without exposed fasteners or protruding moldings. Imbedded reinforcements shall be installed at all door openings in order to support door mounting hardware and door operating mechanisms. All door openings shall have full structural framing to maintain integrity of the body structure.
- d. Interior panels may be an integral part of the FRP composite panel. Where threaded fasteners are in the interior panel only an imbedded reinforcing nut or a reinforcing panel shall be integrated into the FRP composite for added strength and fastener retention.
- e. Exterior panels may be an integral part of the FRP composite panel. Exterior panels shall be sufficiently stiff to prevent

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vibration, drumming, or flexing while the bus is in normal service. Lower skirt panels shall be sufficiently fastened and braced to prevent damage from ice and snow build-up. Lower skirt panel may be one piece and shall be repairable. Where panels are lapped, the upper and/or forward panels shall act as a watershed. Sealing and fastening of joints, including front and rear cap-to-body joints, shall prevent entrance of moisture and dirt. All exterior panels shall be bonded to the lower body frame.

- f. The outside body panels shall have on each side one heavy-duty rubrail. Rubrails shall be extruded solid aluminum with a flexible, rubber-type resilient material insert (minimum $1\frac{1}{2}$ " x $\frac{1}{2}$ ") or $1\frac{1}{2}$ " x $\frac{1}{2}$ " minimum solid rubber-type of flexible, resilient material. Rubrails shall be located no less than 25" nor more than 36" above the ground on each side. Rubber fender splash guards shall be installed on front and rear wheel openings. Where the rubrails and fender opening guards are not an integral part of the body, installation of rubrails and fender opening splash guards shall be made after the finish coat of paint is applied to the bus.
- g. No sheet metal screws shall be permitted, except for rubrails and rubber fender splash guards which can be secured with locking, self-tapping bolts. Fastener materials shall be compatible with materials being fastened. Where self-tapping bolts are used in body panel, the body panels shall have an imbedded reinforcing nut or a reinforcing panel shall be integrated into the FRP composite for added strength and fastener retention. In no case shall the sealing of the panels be dependent on caulking alone.
- h. Window openings cut into body panels shall have a maximum clearance of **C**" around frame, $1/16$ " on each side, to minimize the need for caulking (see Section II. V., Windows). All openings cut into body exterior panels must have the exposed edges of the cutout properly coated to prevent moisture intrusion before further assembly or painting occurs.

C. Passenger Door

- 1. The manufacturer shall provide a heavy duty electrically operated passenger entrance door. The passenger entrance door shall be a split-type double leaf swing door. This door shall have a flexible soft rubber cushion on the meeting edge $1\frac{1}{2}$ " in width, minimum. The door glass shall be see-through, tinted (AS-2) safety glass. Under all operating conditions and vehicle speeds, an airtight, watertight and dust-proof seal shall be formed between the door and the stepwell, between the door and body opening, and between the door leaf sections. The door leading edge opening speed shall not exceed 18 inches per second and the closing speed shall not exceed 12 inches per second to provide a total door closing or opening in 2 to 4 seconds. The front passenger entrance door shall not extend below the step frame. The door shall be located on the right side of the vehicle. The entrance door shall provide a 30" clear width opening, minimum. Door opening height from the top of the first step to the door header shall be a minimum of 76". Where interior height is low at the entrance header, the header shall be padded to prevent injury to those exiting the vehicle.

2. The electric door operator for the entrance door shall be located in an overhead compartment above the passenger entrance doorway; shall be concealed from passengers; and shall be easily accessible for servicing. The overhead compartment access panel for the operator shall be hinged or removable (secured with threaded fasteners retained by nut inserts). Door motor operation shall be limited electrically to control door travel at full open and full closed positions. Physical door stops shall only prevent marring or damage to doors and/or surrounding parts.
A self-restarting manual release shall be provided to allow the entrance doors to be manually opened in the event of loss of electrical power or other emergency. The door operator motor shall not run continuously when the manual release is operated. Electric door operator, door linkage, and baseplate components shall be of a single manufacturer. Suggested source: Excell, Manufacturer's Standard, Vapor or equal.
3. The passenger door control switch shall be located in the driver's compartment within easy reach of the driver and be clearly marked for "open" and "close" (switch shall operate the same on all buses). The control switch shall be powered by a constant battery feed circuit with circuit breaker protection. The control switch shall be "hold on" for operation.
4. A method shall be provided to lock the bus when it is not in use.

D. Passenger Stepwell

All steps and stepwells shall be gage number 14 (.075" thickness) galvanized steel, minimum, with adequate structural bracing. All metal trim hardware in the stepwell area shall be stainless steel. All fasteners in the stepwell area shall be bright finished corrosion resistant coated/plated screws or stainless steel which will pass the 1000 hour ASTM D117 Salt Spray test and the 1000 hour ASTM D2247 Humidity Resistance test. Ground to first step shall not exceed 12" in height, each additional vertical step shall not exceed 9" and all tread depths shall be 9" minimum. Stepwells shall be covered with rubber (see Flooring, Section II., F., Item 5). Any exposed stainless steel shall be brushed, not painted.

E. Interior

1. The interior of the vehicle shall provide a pleasant, aesthetically pleasing atmosphere. The door and driver instrument panel are to be painted or otherwise finished with a nonreflective, anti-glare finish which matches the overall interior tones of interior panels. All interior markings shall be durable materials affixed to the interior panels' smooth surfaces or markings shall be durable materials affixed to metal plates fastened to the interior panels of the bus. The interior design and colors shall be approved by the State.
2. All interior panels may be made of scuff-resistant, vinyl-coated aluminum, textured paint on steel, or laminate/FRP finished material. A light grey color shall be installed in the interior area above the seat rail lines, in the ceiling area, and on the rear endwall. Standard flooring material (coved to the floor) shall be installed on the sidewalls below the seat rail lines. All materials and treatments shall be easily cleaned. Panel fastening devices shall match color of panels. All interior finished surfaces shall be impervious to diesel fuel, gasoline, and commercial cleaning agents. Finished surfaces shall not be damaged by controlled applications of graffiti-removing chemicals.

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3. The interior height of the passenger compartment at center aisle shall be 74" minimum. At 6" from the sidewall there shall be 67" of interior height, minimum, with a gradual contour to the center aisle (no bulkheads). Interior headroom at the back of bus (rear AC evaporator area) may be reduced to a minimum of 60 inches, but it shall increase to the normal ceiling height at the front of the rear seat cushion. The interior width at seat line shall be 90", minimum.
4. All surfaces, items, or hardware in the passenger compartment having sharp edges, corners, or angles that could cause injury, shall be padded with a heavy-duty, vinyl-covered, energy absorbing material to match interior colors. Areas of low headroom where a person is prone to strike his head shall be marked and padded. All handrails shall have rounded edges where exposed.
5. A storage area with access door shall be provided in the interior area above the windshield where space permits.

F. Flooring

1. The floor deck may be integral with the basic structure or mounted on the structure securely to prevent chafing or horizontal movement. All floor fasteners shall be corrosion resistant steel and shall remain secured and corrosion resistant for the service life of the vehicle. The floor deck shall be $\frac{3}{4}$ " C/C plywood of pressure treated exterior grade material, minimum, with sealed edges to prevent moisture intrusion. The floor deck shall have all cracks and voids filled and the whole surface rough sanded before installing the rubber flooring material. The floor deck, including the sealer, attachments, and coverings, shall be waterproof, non-hygroscopic, resistant to wet and dry rot, resistant to mold growth, and impervious to insects.
2. The stepwell, entrance area, and center aisle floor area shall be overlaid with ribbed, slip resistant, oil resistant commercial RCA Rubber Transit-Flor® or equal, 1/8" floor and 3/16" step tread thickness.
3. The aisle to door area flooring joint shall make a miter so that aisle and door area flooring grooves line up for easy cleaning. Flooring adhesive shall be oil resistant.
4. The 1/8" thickness flooring under the seats and in the wheelchair area shall be smooth, slip resistant, oil resistant RCA Rubber Transit-Flor® or approved equal. The flooring shall extend up the sidewall to the seat rail line and shall be coved at the floor/wall joint to form a smooth water tight transition.
5. Step treads shall be one-piece ribbed rubber flooring with steel backing plate. All step edges (nosings) shall have a band of bright yellow contrasting color running full width of the step. An aisle width standee line of bright yellow contrasting color shall be in the aisle just behind stepwell (must meet ADA contrast requirement).
6. Color of all flooring shall be as follows: RCA colors--Grey #766 or tan #747 or equal.
7. To provide easy access for service, the floor shall have a vapor and fumeproof bright aluminum diamond plate access panel to reservoir fill/check areas and fuel tank sending unit.

8. Wheelwells shall have minimum yield strength of gage number 14 (.075" thickness) galvanized steel, gage number 16 (.060" thickness) stainless steel, or gage number 12 (.10" thickness) aluminum with continuous weld to the reinforced heavy-duty gage number 12 (.125" minimum) floor structure. Wheelwells may be of FRP material that is equal to gage number 14 galvanized steel. Wheelwells shall be thoroughly sealed to prevent intrusion of moisture and dirt. Wheelwells inside the passenger compartment shall be covered with rubber flooring or molded fiberglass.
9. Standee decals shall be furnished and mounted at the center of the coach above the windshield.

G. Emergency Exits

1. Each bus shall be equipped with a rear exit door with an opening of 1440 square inches or approximately 24" by 60" minimum (a rear exit window is optional). The rear door exit and side window exits shall meet federal requirements of FMVSS 217. The manufacturer shall provide a method to lock the rear exit door. The rear exit door shall have an audible alarm at the driver's area activated when the exit door latch handle starts to open and when the exit door is locked with the ignition on. A bus with a rear exit door shall have one small window on each side of the exit door in the rear endcap.
2. The rear exit door shall have an upper window and a lower window. The door glass shall be see-through, tinted (AS-2) safety glass. Door window height shall match top of rear bus windows, one on each side of rear door. Door windows shall match design of bus rear windows. Heavy-duty door latch mechanism with handle guard shall provide a quick release for opening from inside and outside the vehicle but be designed to offer protection against accidental release. Door latch shall cause the door to compress the perimeter door seal to provide an airtight, dustproof and watertight seal around the door under all operating conditions and speeds. Door panels shall match exterior and interior body panels (see section II. A., B., and C.). All doors shall be fitted with bolted on heavy-duty stainless steel piano hinges or heavy duty hinges of a noncorrosive material. A restraint shall be installed to prevent the door from opening beyond 100° or striking the rear panel of the bus when the door is opened.
3. A passage way of 16" minimum width shall be provided to the rear exit door. No seats or other objects shall be placed in bus which restricts passageway to rear exit door.
4. One non-closing static exhaust vent, combination roof ventilatory-emergency escape hatch (23" by 23" minimum) shall be installed at the ½ point on the longitudinal center line of the roof of the passenger section of the bus. The roof vent-escape hatch shall provide fresh air inside the vehicle when opened and when the bus is in a forward motion. The vent shall have an inside and an outside release handle. Suggested source: Transpec Inc., DMA 1122 or equal.
5. All emergency exits shall be marked with instructions for proper use. All interior markings shall be durable materials affixed to the interior panels' smooth surfaces or markings shall be durable materials affixed to metal plates fastened to the interior panels of the bus.
6. Lever-type latches used for emergency windows shall secure the windows tightly shut, shall be easily operated, and shall not unlatch due to

vibration during normal bus operation. The latches shall be made of non-corrosive materials and be designed for minimal maintenance needs.

H. Gauges

Chassis OEM gauges shall be used in the driver's instrument cluster, but if they are not available VDO brand gauges, Stewart Warner gauges, or equal shall be used. Each vehicle shall have an instrument cluster with the following non-glare needle-type gauges which are easily monitored by sight from the driver's position (lights in lieu of gauges are not acceptable).

1. Voltmeter and its wiring shall be compatible with generating capacities.
2. Engine oil pressure gauge.
3. Engine coolant temperature gauge.
4. Fuel gauge.

I. Farebox

1. The farebox (a donation box is optional) shall be mounted with the trip handle toward the driver and within easy reach of the driver. The farebox shall be mounted on an adequately braced stanchion; shall be located over a flat floor surface near the driver; and shall be accessible to passengers entering bus (meet ADA requirements). An amber or indirect farebox light shall be connected through an entrance door jamb switch to the running light circuit.
2. The farebox shall be lockable and supplied with two vaults that are interchangeable and lockable (2 keys for each lock). The vaults shall be keyed alike. The vault and farebox exteriors shall be marked with key reference. (Location shall be approved by the State at pilot model inspection.) Suggested source: Main Farebox Model M-4 or equal.

J. Bumpers

The vehicle shall be equipped with front and rear high energy absorbing bumpers. Both bumpers shall be installed per bumper manufacturer's specification and use a minimum of SAE grade 8 bolts in all attachment brackets. Bumper installation shall allow space between bumper and body for energy absorption movement without body damage. Lifting pads shall be provided as part of the vehicle so that the vehicle may be lifted (at curb weight) at the front and the rear without any deformation or damage to the vehicle or bumpers and mounting hardware. Suggested source: Romeo R.I.M. Inc. H.E.L.P. bumper, or equal.

K. Mud Flaps

The vehicle shall have commercial grade anti-sail mud flaps/splash aprons behind front and rear wheels which contain no visible imprinted logo or advertising. The flaps/aprons shall be securely fastened with full width metal strips and bolts (flap/aprons shall be compressed between bracket and metal strips) and shall extend to within 6" of the road surface at curb weight. The mud flaps/aprons shall be at least 1" wider than the tire widths (single front , dual rear) to stop splash at the rear of wheel openings. Rubber fender splash guards shall be installed on all wheelwell openings. Other mud flaps/splash aprons shall be installed where necessary to protect bus equipment (A/C components, batteries, front wheel inner shield, and the

like) from road splash.

L. Towing

Tow hooks shall be provided with two in the rear and two in the front of the bus, which shall be of sufficient strength to tow 1½ times the GVWR of the bus. Tow hooks shall be easily accessed and free of interference with bumper system when in use. Access to tow hooks may be made through holes in the bumper assembly. The intended use for tow hooks is only to safely move the bus to a point of tow truck hook-up. Tow hooks shall be installed to prevent them from dragging when the bus is driven over an incline. The tow hooks shall be mounted and adequately secured to the chassis frame as recommended by the tow hook manufacturer or may be supplied as standard equipment on the OEM chassis. The vehicle shall be designed to be towed from the front or from the rear. The bidder shall provide the towing and lifting procedure to be followed.

M. Rustproofing/Undercoating

When the unit is completed, the sections of the underside of the vehicle exposed to the elements shall be treated with an undercoating material. All box type tubing used in the floor structure shall have the interior of the tube coated with corrosion resistant material equal to Ziebart Type A. Sections that are treated shall be properly cleaned to remove greases, oils, and residues before application of the corrosion-proofing material. All mechanisms (moving or stationary parts) that are affected or rendered useless by an application of sealant or insulation shall be cleaned free of sealant or insulation including vent canisters and drain pipes. Rustproofing/corrosion-proofing shall be warranted for the same period covered by the body/structure warranty. Suggested source: Tectyl 121-B or equal for all sections other than the interior of box tubing.

N. Interior Mirrors/Sunvisors

1. Interior Mirror

Interior mirror (with adjustable mounting bracket) shall be a 4" by 16" flat mirror glass with rounded corners, minimum, or an 8" minimum diameter convex 15 degree radius (curvature) mirror. The driver shall be able adjust the mirror so that the complete passenger compartment can be viewed through interior mirror. Location shall be determined at pilot model inspection. Suggested source: ROSCO model 416 (with bracket), B&R Manufacturing #1716, Manufacturer's standard, or equal.

2. Sunvisor

Windshield sun visor system shall be standard OEM chassis visor(s). If the OEM chassis is not equipped with a windshield sun visor, large transit-type, fully adjustable arm-type plexiglass sun visor(s) shall be provided for the driver at the windshield. Location shall be determined at pilot model inspection. Suggested source: manufacturer's standard.

O. Exterior Mirrors

1. Each bus shall be equipped with exterior left-hand and right-hand rear view mirrors of flat glass with convex mirrors (3" in diameter, minimum) attached or a combination flat/convex glass. The mirror shall contain at least 50 square inches of flat glass viewing area. Suggested source:

RAMCO, B&R Manufacturing, Metagal, or equal.

2. To prevent obstructed front and right-hand view a convex 15 degree radius (curvature) exterior crossview mirror (8" minimum diameter) shall be provided on the left-hand front corner of the bus. Suggested source: Manufacturer's standard.
3. All exterior mirrors shall be constructed with high impact plastic or stainless steel housings.
4. Mirror mountings shall be reinforced when not in a structural frame member, with approval by the State at the time of pilot model inspection. The mirror placement shall not obstruct driver vision nor have window divider bars between the driver and mirror face. Final location of exterior mirrors shall be determined at pilot model inspection.

P. Seats

1. Driver's Suspension Seat

- a. The driver's seat shall be a mechanical suspension seat with mounting base (riser), and right hand (RH) armrest. The seat shall comfortably hold and support the human body in the correct position for driving. The driver's seat shall have adjustments for: 1) fore and aft slide, 4" minimum travel: 2) back recline, 20 degrees minimum: and 3) weight range for people up to 300 pounds. While seated, the driver shall be able to make all of these adjustments by hand without complexity, excessive effort, or being pinched. Manual operated adjustment mechanisms shall hold the adjustments and shall not be subject to inadvertent changes. The seat shall be high-backed and shall have a manually adjustable lumbar support in the region of the back frame. The seat shall have a dust seal (bellows) to enclose the mechanism and seat mounting base. The seat and the seat mounting base shall be properly aligned behind steering wheel to allow for maximum seat adjustments and operator comfort. The seat belt with shoulder harness and automatic retractor shall be attached to the seat to incorporate the OEM Supplemental Restraint System. All seats and seat mountings shall meet applicable federal standards. Suggested source: Seats Incorporated Magnum 200 Mechanical Suspension Seat or equal with armrest.
- b. The driver's seat cushion shall be molded high resilient (HR) polyurethane foam padding with indentation load deflection (ILD) 35 pounds minimum, and back cushion shall be molded or fabricated high resilient (HR) polyurethane foam padding (ILD) 25 pounds minimum. There shall be no welt or bead across the front of the seat cushion under the driver's legs. Compressions to 10 percent maximum and tensile strength, 15 pounds per square inch (PSI) minimum. Seat and back cushion foam shall meet the typical physical properties of ASTM D-3574 and the flammability requirements of FVMSS 302.
- c. The driver's seat covering shall be gray Cloth-type Woven Fabric (with flame retardant qualities).

- (1) Minimum weight 36 ounces per linear yard.
- (2) 50,000 minimum double rubs (ASTM - 3597-77 Wyzewbeek Method).
- (3) Color fastness to light 300 hours minimum (AATCC-16-1977 Carbon Arc.)
- (4) Comply with cloth-type woven fabric seat material test and performance criteria of the Federal Register dated October 20, 1993 (see Section IX., table 1).
- (5) Comply with California BLT-117.
- (6) All Cloth-type woven fabrics except Holdsworth Wool shall be treated with a flame proofing solution following the manufacturer's specifications, No-Flame by Amalgamated Chemical Inc. or equal.
- (7) Suggested source: Flame Resistant Fabrics by Kings Plush, Holdsworth Wool or equal.

2. Passenger Seats

- a. All passenger seats are required to meet the following:
 - (1) Complete White Book tests
 - (2) All applicable FMVSS testing including FMVSS 210
 - (3) Comply with cloth-type woven and vinyl fabric seat covering material test and performance criteria of the Federal Register dated October 20, 1993(see Section IX., table 1).
- b. Two passenger, forward facing seats shall be 35" minimum width with back mounted energy absorbent grab handle on each seat back (two per double seat).
- c. Single passenger seats shall be 17½" minimum width with back mounted energy absorbent grab handle.
- d. Forward facing seats shall have 27" minimum knee to hip room.
- e. Aisle facing seats shall have arm rests on both ends if the seat is not against modesty panel.
- f. Aisles shall not be less than 16" wide.
- g. Suggested sources: CE White Co. L Series; Freedman Feather Weight; or equal.

3. Wheelchair Lift-Equipped Buses

Forward facing (double) fold-away seats with seat belts shall be provided in the wheelchair securement area per seating arrangements (see Section III, Wheelchair Securement Area). Fold-away seats shall include all dimensional, structural and testing requirements of the standard seat specification. Seat locking/latching devices shall be of high quality and be easy to latch and unlatch. Seats must positively latch in the seated and folded position to prevent inadvertent folding or unfolding of the seat. Any support legs resting on flooring shall be non-marring or rest on metal plates flush mounted with flooring. All

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fold-away seats shall be able to pass FMVSS 210 without having to fasten additional latches or cables. All fold-away seats shall fold against the wall when wheelchair space is required (no further than 12" from wall in the vertical folded position). Seat may not extend into bus more than 36" (two passenger) and 18" (1 passenger) when folded down for passenger seating. Aisle space may be reduced to 14" inches where fold-up seating is placed on each side of the aisle. The seat bottom cushion shall be a 5 degree tilt up from level, minimum, and back cushion shall be at 95 degrees, minimum. The seats shall be of the same design as the other passenger seats. All seat backs and all seat bottoms of fold-away/fold-up seats shall be covered with material matching seat cushion color and fabric. Suggested source: CE White Co., L-Series; Freedman Feather Weight; Braun #125; or equal.

4. All Seats

Seats shall be individually contoured to each passenger for occupant comfort and retention. Seats shall be covered with cloth-type woven fabric or vinyl fabric at transit agency's option. Cloth-type fabric or vinyl shall completely enclose the seat cushion and the seat back. Cloth-type fabric or vinyl shall comply with test and performance criteria of the Federal Register dated October 20, 1993 (see Section IX., table 1). Colors shall be tan with multi-color center insert or grey with multi-color center insert and approved by the State.

a. Cloth-type Woven Fabric Requirements (with flame resistant qualities)

- (1) Minimum weight 23 ounces per linear yard.
- (2) 50,000 minimum double rubs (ASTM - 3597-77 Wyzewbeek Method).
- (3) Color fastness to light 300 hours minimum (AATCC-16-1977 Carbon Arc.)
- (4) Comply with cloth-type woven fabric seat material test and performance criteria of the Federal Register dated October 20, 1993 (see Section IX., table 1).
- (5) Comply with California BLT-117.
- (6) All cloth-type woven fabrics except Holdsworth wool shall be treated with a flame proofing solution following the manufacturer's specifications, No-Flame by Amalgamated Chemical Inc. or equal.
- (7) Color combination shall be solid color with a multi-colored center insert approved by the State.
- (8) Suggested source: Flame Resistant Fabrics by Kings Plush or Holdsworth Wool or equal.

b. Vinyl Fabric

- (1) Seat vinyl fabric shall be transportation grade expanded vinyl, 36 ounces per linear yard minimum.
- (2) Seat vinyl fabric shall comply with test and performance

criteria of the Federal Register dated October 20, 1993 (see Section IX., table 1).

- (3) Vinyl-coated fabric shall meet the requirements of Federal Specification CCC-A-680a Class II, treatment A1.
- (4) Color combination shall be solid color with a multi-colored center insert approved by the State.
- (5) Suggested source: Flame Resistant vinyl by GenCorp Polymer Products or equal.

c. **Seats General**

- (1) Seat cushion and back cushion shall be fabricated high resilient (HR) polyurethane foam padding. Seat cushion indentation load deflection (ILD) shall be 35 pounds minimum, with compression to 15 percent maximum, and tensile-strength of 15 minimum. Seat and back cushion shall meet the physical properties of ASTM D-3574 and the flammability requirements of FMVSS 302, minimum. The technical data sheet for the foam supplied shall be included in the bid proposal with the seat information. Suggested source: Manufacturer's standard.
- (2) The seating arrangements and configuration shall be furnished by the State.
- (3) Seat covering materials shall be solid color with a multi-colored center insert approved by the State. All seat covering materials shall comply with test and performance criteria of the Federal Register dated October 20, 1993 (see Section IX., table 1).
- (4) All seats shall be supported on the floor with high carbon steel T-type support brackets with a powder coat epoxy paint finish. Floor anchorage shall be neat and not interfere with entering and exiting the seat. All seat mounting bolts shall be a bright finish corrosion resistant coated/plated fastener. All seats and seat mountings shall meet all applicable FMVSS including FMVSS 207, 208, 209, and 210.
- (5) Seat frame shall be cold-roll steel tubing. The frame shall have a powder coat epoxy paint finish.
- (6) Seat and back cushions shall be supported with a spring-type support system. Seat and back cushions shall be completely covered with covering material. Seat back depth shall not exceed 3½" overall.
- (7) All metal components of the seat assembly shall be coated with a powder coat epoxy paint finish that shall meet the following tests:

Salt Spray	1000 hrs	ASTM D117
Humidity Resistance	1000 hrs	ASTM D2247
Impact Resistance	to 80 in-lbs	ASTM D2794

All testing is to be performed on standard seating metal

materials that have coating thickness of 1.3 to 1.8 mils.
Certified test documents are required with bid proposal.

5. Passenger Seat Belts

The successful bidder shall provide certification test data that the seats, the seat belts, and the installation are in compliance with FMVSS-207, 208, 209, and 210 where applicable (see Section VIII. L.).

Three universal "Buckle Up" decals approximately 6" by 6" shall be furnished loose with each bus. Decals shall indicate that belt use is suggested only.

All seats shall be equipped with seat belts for each designated seating position. Belts shall have:

- a. An emergency locking retractor. The retractor shall not be attached to the seat structure. The retractor shall be part of the latch end of the belt.
- b. A push button latch release mechanism.

Q. Handrails, Stanchions (Shall meet ADA regulations)

1. The handrails and stanchions shall be a minimum of 1¼" outside diameter. All handrails and stanchions shall be positioned so as not to interfere with wheelchair movement and shall meet ADA requirements for position and size. All handrails and stanchions in the passenger entrance area shall be highly visible yellow in color. All other handrails and stanchions shall be brushed stainless steel. Mounting brackets and fittings shall be composed of the same kind of material used for the stanchion or handrail.
2. All handrail and stanchion mountings shall have reinforcement plates welded to or imbedded in the structure behind surface panels of sufficient strength to withstand passenger force. Final locations shall be determined at pilot model inspection.
3. A floor-to-ceiling vertical stanchion shall be provided in close proximity to the rear of the driver's area. A guardrail shall be provided in back of the driver's area extending from the vertical stanchion to the left side of the coach 30" (plus or minus 2") above the floor. A padded modesty panel shall be provided from the guardrail to within 8" of the floor. Stanchion and guardrail shall not restrict any driver's seat adjustments. Vertical stanchion may be used for farebox mounting.
4. A smoked plexiglass panel, 3/8" thick, shall be provided behind driver from top of driver's seat to within 6" of bus ceiling. Panel shall not impair driver's seat adjustments. Panel shall be located to allow the driver's seat back to recline to ½ its maximum reclined adjustment with the driver's seat in the position furthest from the steering wheel. Panel may be incorporated into stanchion and guardrail behind driver
5. Floor-to-ceiling stanchions (yellow) shall be provided near aisle on each side of front entrance. Front passenger entrance forward side stanchion may be used for farebox mounting.
6. Left and right side entrance handrails (yellow) shall be installed from

low stepwell to floor-to-ceiling stanchions near aisle. Entrance handrails shall be positioned so passengers entering or exiting the vehicle will have handrail support throughout the entering/exiting process and so that articles of clothing may not become entangled in the handrail-stanchion-guardrail assemblies.

7. A guardrail (yellow) shall be provided in front of and at the rear of the front entrance steps, extending from the vertical stanchions to the right side of the coach 30" (plus or minus 2") above the floor. A modesty panel (padded both sides, vinyl clad) shall be provided to the left (rear side) of the entrance from guardrail to floor (in case of lift vehicle, provide floor-to-ceiling stanchion with guardrail and modesty panel to rear of platform lift).

R. Interior Lighting

1. Overhead entrance and stepwell lights shall provide no less than two foot-candles of illumination on the entrance step tread, or lift or ramp with the door open. Outside light(s) shall provide at least 1 foot-candle of illumination on the street surface within 3 feet of step tread outer edge. This system shall provide illumination automatically when the door is open and meet ADA requirements.
2. Overhead entrance and stepwell lights shall be wired to and automatically activated by a door controlled switch.
3. Stepwell light shall be on the side away from wheel splash.
4. Interior lighting shall provide a minimum of two foot-candles of illumination at a reading level. Interior lighting fixtures shall be reasonably flush with the interior walls and ceiling so no hazard exists for the passengers. All lights shall have lead wire long enough to remove light at least 6" from vehicle for service. All interior lights shall be grounded by an in-harness ground attached in the fuse panel to a common grounding point.
5. Light installation shall be designed to illuminate lift platform when deployed at floor level at no less than two foot-candles of illumination. Outside light(s) shall provide at least 1 foot-candle of illumination on the street surface within 3 feet of step tread outer edge. This system shall provide illumination automatically when the lift door is open and meet ADA requirements. On-off light switch shall be door-actuated.

S. Exterior Lighting

1. Exterior lighting shall be in accordance with Federal Motor Carrier Safety Regulations (393.11) and ADA regulations. All lights shall have lead wire long enough to remove light at least 6" from vehicle for service.
2. Exterior marker lights shall be 2" diameter flush style sealed lamp retained in a rubber grommet mounting and conform to Federal Motor Carrier Safety Regulations Part 393. Peterson Lamp, Trucklite or equal. All marker lights shall have a weather proof two prong (one positive and one ground) plug-style connector with the ground wire connected to an in-harness ground attached in the fuse panel to a common grounding point. Marker lights shall be operated through a relay controlled by the headlight switch.

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3. One high mount stop lamp (red 4" round sealed voltage regulated LED lamp) centered in the rear panel of the bus shall work in conjunction with the brake lights. On buses with a rear emergency exit door, the light shall be mounted on the rear of bus body above the rear emergency exit door or between the windows on the exit door. On buses with a rear emergency exit window, the light shall be mounted on the rear of the bus body just below the rear emergency exit window. Final location of high mount stop lamp shall be determined at pilot model inspection.
4. All exterior lights shall be grounded by an in-harness ground attached in the fuse panel to a common grounding point. All exterior lights of the bus shall be sealed lamps properly mounted except for headlamps. Headlights shall be Halogen lamps and the front park/turn lights may be a part of the headlight assembly.
5. All lights shall be sealed from moisture with sockets mounted to top where possible and the mounting to body shall be sealed. All lights in the rear panel of the bus shall be flush style round sealed lamps (by Peterson, Truck-Lite or equal) retained in a rubber grommet mounting, except the license plate lamp.
6. Brake lights shall be red 4" round sealed voltage regulated LED lamps and shall not override hazard flashers or turn signals. Rear turn signal lamps shall be amber 4" round sealed voltage regulated LED lamps.
7. Hazard flashers shall be equipped with a heavy duty dash mounted control switch with indicator (audible and light) and heavy duty transistorized flasher. The control pull/push knob shall be within easy reach of the driver and the indicator light shall be in clear view of the driver. Final location of hazard flasher control and indicator shall be determined at pilot model inspection. Hela, Signal Stat or equal.

T. Safety Equipment

All safety equipment provided by the manufacturer shall be secured to each vehicle and be easily accessible to the driver. Location of safety equipment shall be determined at pilot model production. The safety equipment shall be:

1. One UL listed 6 pound, 2A-10BC dry chemical fire extinguisher. Fire extinguisher shall have a metal head, a gauge to indicate state of charge, and a bracket with strap for securement. Source: Manufacturer's Standard.
2. One container of bi-directional emergency reflective triangles that meets FMVSS 125.

U. Heating/Ventilating/Air Conditioning (HVAC)

1. Front heating shall be automotive in-dash type. Front and rear heavy-duty heating system shall be capable of raising the interior temperature of a bus from 0°F to 60°F at knee level throughout the interior of bus in 30 minutes from engine startup during normal passenger service without using any type of auxiliary heating system. While the bus is in any type of passenger service, including service for people with disabilities, the front and rear heavy-duty heating system shall be sufficient to maintain 64°F at knee level throughout interior of bus and at the driver's foot space when the outside temperature is 0°F. In addition to the front heater and windshield defrosters, one 6" two speed fan with non-glare blades and flat black body shall be mounted in the

driver's area for increased air circulation. Bus HVAC shall be capable of delivering heat, fresh air ventilation, and air conditioning (optional) to the driver's area. Driver's area shall have air circulation in each mode of defrost, heat, fresh air ventilation and air conditioning (optional) of 125 cfm at the foot area, with a total driver's area circulation of 400 cfm minimum. Grounding for all heater fan motors shall be supplied by an in harness ground wire attached in the fuse panel to a common grounding point. All fan motors shall be supplied with proper radio frequency (RF) suppression equipment to reduce two-way radio interference.

2. Rear heating unit(s) shall distribute heat in at least a 180° direction and ensure air distribution to all areas of the bus interior. Heating unit(s) shall have a minimum 2" I.D. inlet and outlet with a BTU/hr output rating to match specified HVAC performance requirements. Heating units shall have rubber or nylon insulator(s) between mounting base and floor of the bus. Suggested sources: Bergstrom, A. R. Lantern, AMFAB Inc., or equal.
3. The entrance stepwell shall include a 12 volt electric heating element/unit for the lower step to prevent icing of entrance steps. The low voltage step heater shall consist of one or more wire elements laminated and vulcanized between two plies of .026" silicone rubber impregnated fiberglass cloth to maintain an approximate temperature of 160° F with a low temperature (30°F) sensing switch--Warm Welcome® by Lighthouse International, Ltd., or equal. The entire lower step heating unit with power wires shall be enclosed between the stepwell and the step tread (beneath the step tread) of the lower step. Lead wires shall be loomed, supported by brackets, and protected by grommets where they pass through structure. The temperature sensing switch shall be located in a protected area under the bus in the stepwell area.
4. The premium heater hose (2" minimum) shall be high temperature resistant Ethylene Propylene Diene Monomer (EPDM) material. Hose shall be a reinforced type with Aramid knitted fiber reinforcement between the EPDM tube and EPDM cover. Heater hose material shall be compatible with all types of coolant including long life coolant. Rated temperature limits of the hose shall be -40°F to +300°F with a burst pressure of 130 PSI.
5. Heater inlet and heater outlet at the engine shall have 2" ID heavy-duty brass 1/4 turn valves for shut off. Shut off valves shall be accessible by personnel without going under the bus. Location to be determined at pilot model inspection.
6. Front heater shall have temperature control valve which can be regulated from the driver's area.
7. All heat lines and hoses shall: have interior routing where possible; be sufficiently protected to ensure against wear from friction and the elements; be insulated to reduce heat loss when exterior routing is used; use routing that eliminates excessive bends and hose lengths.
8. Air Conditioning (see Alternate Quotes, Section VI. A).

V. Windows

1. Windows shall be T-type slider at top , full slider, or top tip-in type for window ventilation. Windows shall have double-density safety glass

and heavy-duty locking features which shall meet FMVSS 217 for emergency exits, if applicable. Caulking around windows shall be used only as a seal, not to make up for body defects or out of tolerance window openings (maximum clearance of **C**" around frame, 1/16" on each side). All window glass shall be tinted (passenger windows AS-3 tint, windshield one solid tint or shaded-tinted) and meet applicable federal standards. Driver's compartment right and left side windows shall be designed for maximum window area to provide unobstructed vision. Driver's right side window shall be one piece. Suggested sources: Hehr, International, Inc., Excel Industries, Inc., or equal.

W. Paint

1. All exterior surfaces shall be smooth and free of visible fasteners (excluding round head structural rivets), dents, and wrinkles. As appropriate for the paint used and prior to application of paint, the exterior surfaces to be painted shall be properly cleaned and primed to assure a proper bond between the substrate and successive coats of original paint. Paint shall be applied smoothly and evenly, with the finished surface free of dirt, runs, orange peel, and other imperfections. All exterior finished surfaces shall be impervious to diesel fuel, gasoline, and commercial cleaning agents. Finished surfaces shall not be damaged by controlled applications of commonly used graffiti-removing chemicals.
2. All exterior paint shall be a two part acrylic-urethane-type or polyurethane-type with low volatile organic compound (VOC) emission. The finish coat of paint shall be applied before rubrail covers or inserts, fender flares, exterior lights, and other body mounted accessories are installed. Paint shall be applied in the following method:
 - a. If on bare aluminum, use proper cleaner. Recommended source: DuPont 2253, PPG or equal, followed by aluminum conversion. Recommend source: DuPont 2265, PPG or equal.
 - b. If on bare steel, use proper cleaner. Recommended source: DuPont 5717S, PPG or equal followed with steel conversion.
 - c. For all bare metal, use primer. Recommended source: DuPont Prime 615/616 (two coats), PPG or equal.
 - d. No primer required on fiberglass surface.
 - e. Coat entire prepared surface to be painted with minimum of two coats of paint properly activated and reduced. Recommended source: DuPont Imron, PPG Concept System, or equal.
3. Vehicle paint schemes of two colors (full color plus 11" wide belt stripe) is standard and will be required when requested by the agency. Color scheme on all vehicles shall be provided at the time of ordering. A single color (no stripe) full paint scheme will be quoted as an option (deduct). An additional single color 11" wide belt stripe (second stripe only) or a roof painted a different color will be quoted as an option.

X. Insulation

1. Inside walls, ceiling, passenger floor area, driver floor area, and fire wall area shall be adequately insulated for sub-zero winters with spray-

type foam insulation or glued in place insulation with a minimum R factor of 5. The insulation shall be non-formaldehyde, fire-resistant (FMVSS 302 minimum), non-hygroscopic and resistant to fungus. Insulation shall prevent condensation and thoroughly seal bus so that drafts cannot be felt by the driver or passengers during normal operations with the passenger door closed. Insulation shall not cover up electrical wiring harnesses, electrical switches, or other devices and shall not be sprayed in wheelwells. All mechanisms (moving or stationary parts) that are affected, create a fire hazard, or are rendered useless by an application of sealant or insulation shall be cleaned free of sealant or insulation including vent canisters and drain pipes.

2. Engine hood cover and driver's area shall have adequate insulation to keep driver's foot area cool during summer months, warm during winter months, and reduce engine noise to an acceptable level.

Y. Lift, Active (Platform Type) (Shall Meet ADA Requirements)

1. The platform lift (active lift) shall be installed in a separate door opening for use by persons with disabilities. The lift assembly shall be mounted within bus body on the right (curb) side. The overhead clearance between the top of the door opening and the raised lift platform, or highest point of a ramp shall be a minimum of 56" for a bus under 22 feet in length or be a minimum of 68" for a bus over 22 feet in length to meet ADA requirements.
2. The lift door(s) shall be manually operated with an outside key locking handle. Gas struts or manual latches shall be provided for the lift door(s) to positively hold the door(s) in the open position. All door openings shall have full structural framing around the opening equal to the structural members of the body. The lift door(s) shall have an upper window similar to the side windows of the bus.
3. The lift shall be an electro-hydraulic type. If the lift has a crossbar, it shall be above the door opening and well padded. The platform lift equipment shall be a double "C" channel parallel arm construction, hydraulically operated by two single-acting cylinders with gravity unfold, gravity down, power up, and power fold (stow) operation. No part of the lift platform shall exceed 6 inches/second during lowering and lifting an occupant, and shall not exceed 12 inches/second during deploying or stowing. Successful bidder shall deliver the lift equipped bus with the type of lift equipment requested by the State. Suggested sources: Braun, Ricon, or equal.
4. A manual safety override shall be provided. Lift shall have manual override instructions visible from inside and outside the bus with door open.
5. The entire lift assembly shall be installed inside the bus body and shall have adequate protection installed on all sharp corners or items that protrude into the passenger area to prevent accidental injury to passengers. Wall and floor mounting points shall be reinforced and shall be attached with fasteners having a thread locking feature.
6. A lift control interlock system shall be installed that shall ensure that the vehicle cannot be moved when the lift is not stowed and that the lift cannot be deployed unless the interlock is engaged (to meet ADA regulation in 49 CFR Part 38, Subpart B--Buses, Vans and Systems, REVISED 3/99

§38.23, (b)(2)(i). The interlock system shall engage when the lift operation sequence is followed. Interlock operating instructions shall be included with the bus at delivery. An indicator light (red, labeled) shall be provided at driver's station that is activated when the lift door is open and when the lift is in operation.

7. The lift color shall be approved by the State.
8. Lift vehicle shall display international symbol of accessibility, one each on left and right side of vehicle. Location shall be determined at pilot model inspection.
9. The active lift shall meet ADA requirements as well as these minimum requirements.
 1. Capacity 600 pounds minimum.
 - b. Usable platform width 32" minimum.
 - c. Usable platform length 48" minimum.
 - d. Platform shall include automatic locking inboard (minimum 6" height) and outboard safety wheel stops to prevent wheelchair from rolling off.
 - e. Platform shall automatically stop at floor level.
 - f. Platform shall automatically stop when lowered to ground level.
 - g. Controls shall be conveniently located on a flexible, cut resistant cable and shall be mounted with access from inside or outside the vehicle.
 - h. Platform, bridge plate, and area between bridge plate and aisle shall be skid resistant.
 - I. Bridge plate and platform shall be coated to resist rust.
 - j. Platform shall have horizontal handrails (one each side) on platform to assist passenger during lift operations. Handrails shall fold automatically to prevent any obstructions into the vehicle passenger area.
 - k. Lift door operated interrupt switch shall prevent use of lift with lift door(s) closed. Heavy duty long life switches shall be used in this application.
 - l. The color of the lift shall coordinate with bus interior colors.
 - m. Sharp corners of lift platform shall be padded when in stored position (remove for lift use).
 - n. The wheelchair lift shall comply with all federal, Americans with Disabilities Act (ADA), and Veterans' Administration regulations.
 - o. Lift platform shall be fitted with device to prevent platform from touching or leaning against door after being returned to stored position when the lift assembly is installed inside the bus body.

- p. No part of the lift platform shall exceed 6 in/sec during lowering and lifting an occupant, and shall not exceed 12 in/sec during deploying or stowing.

III. WHEELCHAIR SECUREMENT AREA

- A. The wheelchair securement system shall be installed according to ADA requirements. Securement location shall be installed as shown by seating plan option and approved at pilot model production. Fold-away seating shall be provided for use when wheelchairs are not being carried as shown in floor plans. The integrated securement system shall restrain the occupant and the wheelchair separately and securely.
- B. Wheelchair securement shall meet these minimum requirements:
1. Forward facing wheelchair tie down and occupant restraint shall consist of four floor attach points for the chair and a lap belt/shoulder restraint for the occupant, per location.
 2. Securement floor anchorage points shall be stainless steel or other noncorrosive metal construction and consist of aircraft type insert pockets that can be flush mounted with the rubber flooring. Floor anchorage points for one securement space shall be spaced at a minimum of 54" from front to rear. Floor anchorage points shall be located no closer than 8" from a stationary wall or obstruction (forward or rearward) that would hinder an operator from attaching the securement system. Anchorage points can be used for the front tie downs, the rear tie downs, or can be shared by both.
 3. Securement wall anchorage point for shoulder restraint shall be stainless steel or other noncorrosive metal construction. Wall anchorage device shall provide vertical adjustment for differences in height of the secured mobility aid. Wall anchor shall be fastened to body structure in the wall according to the manufacturer's installation instructions.
 4. The belt components shall be easily identified as to their location of use as follows: "front", "rear", "lap", or "shoulder". The four belts that attach to the wheelchair shall use a simple speed hook end for chair attachment and have automatic heavy duty retractors with a hard cover and knob control. Belt ends with floor anchor attachments and corresponding floor anchor position shall be color coded for ease of placement identification (belt ends and matching floor position). Automatic retractors shall be part of the belt assemblies for automatic belt tensioning.
 5. All belt components shall meet ADA requirements and random static testing forces equal to:

 rear belt assy. 6,000 lbs. each, minimum
 front belt assy. 2,000 lbs. each, minimum
 lap belt assy. 2,500 lbs. each, minimum
 shoulder belt assy. 2,500 lbs. each, minimum
 floor insert assy. 6,000 lbs. each, minimum
 6. All components shall be able to meet ADA requirements.
 7. Suggested sources: American Seating Advanced Restraint Module; Q'STRAIT Model Q-8100-A1 with scooter pocket; or equal. REVISED 3/99

- C. Containers shall be provided for wheelchair restraints so that the restraints can be stored in the bus when not in use. Location of storage container will be determined at pilot model inspection.

IV. CHASSIS SPECIFICATIONS

The chassis shall have a pre-delivery inspection performed by a representative of the chassis manufacturer before the bus manufacturing process begins. A copy of the completed pre-delivery inspection form shall accompany the bare chassis and accompany the vehicle during manufacture as part of the build order. All standard or optional chassis equipment to be included shall be as advertised by the manufacturer and factory installed and shall not consist of substitute or after market equipment. Optional chassis equipment not available from the factory may be dealer installed. The chassis shall meet the following minimum requirements:

A. Chassis

Commercial or Recreational Vehicle (RV) rated chassis shall be heaviest available for wheelbase and shall have one front axle with single wheels and one rear axle with dual wheels.

B. Tilt Wheel/Power Steering

The steering column shall be adjustable for various up and down positions of the steering wheel. The steering gear shall be a full hydraulic power assist type.

C. Wheelbase

Wheelbase shall be 138", minimum.

D. Engine

The engine shall be a gasoline V8 or V10, fuel injected, 350 CID (6.6R) minimum.

E. Transmission

Heavy-duty, four-speed automatic cooled by an external "H.D. transmission oil cooler" in series with radiator cooler or equal (cooler capacity to match GVWR of bus).

F. Alignment

The bus shall have a four wheel alignment at final point of inspection, just prior to delivery to transit agency. Furnish copy of work order indicating the camber, caster and toe-in settings at time of final inspection and with bus at delivery.

G. Gross Vehicle Weight Rating (GVWR)

Front Axle Rating - 4,600-lb. minimum. Bus shall not exceed chassis manufacturer's rated front axle weight capacity.

Rear Axle Rating, - 9,450-lb. minimum. Bus shall not exceed chassis manufacturer's rated rear axle weight capacity.

Chassis GVWR - 14,050-lb. minimum. (see Purpose of Specifications, Section I)

H. Differential

Heavy-duty differential. Gear ratio shall allow vehicles to travel approximately 65 miles m.p.h. loaded, and not exceed manufacturers recommended engine operating R.P.M.

I. Battery

The battery equipment shall be furnished by the chassis manufacturer where available. The dual batteries shall be maintenance free with reserve capacity of 400 minutes @ 27° C, CCA-1250, 12-volt minimum (dual Delco Group 31-1150 series or equal). The batteries shall be mounted on a stainless steel pull-out tray (easy sliding) with battery hold down secured with bolts. The pull-out tray shall be mounted on properly supported slides with roller bearing equipped roller supports. The battery tray slide shall allow movement to permit full service of batteries outside of the bus body. The inside of the battery compartment shall be covered with a durable insulating material to prevent electrical shorts. The totally enclosed battery compartment shall be vented and the tray shall be coated with an acid resistant coating. The battery compartment must be located below the floor line with adequate reinforcement brackets mounted to floor supports. The insulated battery compartment door shall be manufacturer's standard with thumb latches, and other compartment access doors shall use thumb locks. Battery cables shall be size 2/0 minimum, fine stranded, flexible copper wire with soldered on cable connector ends. Cables assemblies installed in place of chassis manufacturer's battery cables shall be sized to match the electrical system's maximum current draw to provide proper engine starting and operation of all systems. All cable ends shall be fastened in a manner equal to the method used by the chassis OEM.

J. Alternator

The alternator equipment shall be furnished by the chassis manufacturer. Alternator output must exceed electrical equipment load to provide battery maintenance charging. The alternator shall be 124 amps (hot output, minimum), 12-volt dual-belt drive or serpentine belt drive with internal voltage regulator. The alternator shall be supplied with proper radio frequency (RF) suppression equipment to reduce two-way radio interference. Any bracket modifications shall not reduce strength of bracket. Where chassis alternator equipment is not available, use Leece-Neville 4754AA or equal.

K. Fast Idle

The engine shall be equipped with fast idle control which includes manual and automatic control features. Fast idle shall not activate unless parking brake is set and transmission control is in neutral (N) or park (P). The control system shall have a manual switch, volt sensor, an indicator light, and activate automatically from voltage sensors. The system shall automatically deactivate when vehicle is shifted into gear and when the vehicle foundation brakes are applied. Chassis manufacturer's equipment, Vortec MD30-2500, Penntex Model PX-HI-###-### with time out module, or equal.

L. Grounds

Battery positive and ground cables shall be AWG size 2/0 minimum, fine stranded, flexible copper wire with soldered on cable connector ends. Cables assemblies installed in place of chassis manufacturer's battery cables (see Battery, Section IV. I.) shall be sized to match the electrical system's maximum current draw to provide proper engine starting and operation of all

systems. All cable ends shall be fastened in a manner equal to the method used by the chassis OEM. A ground of the battery cable size shall be installed between the engine and chassis frame. The vehicle body shall be properly grounded to the chassis frame. Engine and body grounds shall be installed to handle subsystem electrical capacity. Grounding wires fastened to the frame shall use a bolt with nut installed in a proper sized hole. Lift pump motor shall be grounded directly to chassis frame using a cable of the same size as the pump motor feed wire. All exterior lights and accessories added by the body manufacturer shall be grounded by an in-harness ground attached at a fuse panel common grounding point. For all ground wire connections at the frame, paint shall be removed and a coating of dielectric material applied to the cleaned surface where each grounding cable attaches.

All vehicles shall be supplied with proper radio frequency (RF) suppression equipment to reduce radio interference and improve radio transmission and reception performance. High corrosion resistance and high conductivity braided ground straps shall be added: between the engine and the chassis frame 1" width, minimum; between engine and firewall ½" width, minimum; between frame and body sections ½" width, minimum; and between body sections ½" width, minimum. For all braided ground wire connections, paint shall be removed and a coating of dielectric material applied to the cleaned surface where each braided cable attaches. The removable engine housing with barifoil or other sound deadening material shall be grounded (any removable housing near the engine needs to be grounded). All braided high corrosion resistance and high conductivity ground straps (except those between body sections) shall use the negative battery cable attachment point at engine/frame as the termination point of the RF grounding.

M. Brakes

Foundation brakes shall be a power-actuated four wheel disc type or a disc/drum-type, anti-lock braking system. Heaviest-duty available for stop and go operation. Brake system shall include a low brake warning system.

1. Front Foundation Brakes: disc, 12.5" rotor with 45 square inches of pad lining minimum.
2. Rear Foundation Brakes: drum, 12.125" x 3.5" minimum or disc with rotor and pad of equivalent size to match axle weight rating.
3. Parking Brake - Heaviest-duty available from chassis manufacturer.

N. Fuel Tank

Fuel tank shall be 33-gallon minimum. On gasoline models where the fuel tank is mounted outboard of the chassis frame rail, the fuel tank shall have a protective cage for impact protection provided by the chassis manufacturer in compliance to regulations for school bus fuel tank impact protection. Fuel fill shall be protected from weather.

O. Hazard Flasher

Hazard flashers shall be equipped with a dash mounted control (pull on/push off, lighted knob) switch with indicator (audible and light) and heavy duty transistorized flasher. Final location shall be determined at pilot model inspection. Signal Stat, Hela or equal.

P. Shock Absorbers

Chassis shall have gas filled shock absorbers front and rear, most heavy-duty available from chassis manufacturer.

Q. Springs

Chassis shall be equipped with a heavy-duty spring suspension (front and rear) adequate to match specified GVWR.

R. Stabilizer

Chassis shall have suspension stabilizers as provided by chassis manufacturer.

S. Wheels

Vehicle wheels (6) shall be 16.0" x 6.0" minimum. Wheels shall have stainless steel, steel, or brass valve stems a minimum of 1½" long.

T. Tires

All tires (6) shall be all season, tubeless, steel radial blackwall (LT225/75Rx16E), single front, dual rear. Largest size available from chassis manufacturer to meet GVW rating.

U. Drive Shaft

The drive shaft shall have guards of sufficient strength and be secured to prevent the driveshaft from striking the floor of the bus or the ground in the event of a tube or universal joint failure. Driveshaft guards (OEM chassis equipment preferred, or installed by the chassis manufacturer) shall be equal in materials and design to drive shaft guarding installed on a school bus chassis.

V. Wipers/Horn

Electric wipers shall be two speed, delay style, dual jet washers (electric), with manufacturer's standard arms and blades. The vehicle shall have two electric horns.

W. Radiator and Cooling System

The cooling system shall have an extra cooling capacity radiator, water pump, pulley, and clutch-type fan with coolant recovery system (heavy duty installed by chassis manufacturer). Cooling system shall be winterized with 50/50 mixture of permanent antifreeze and distilled water. Radiator removal instructions and estimated removal time shall be furnished with first bus to each agency. Coolant integrity shall be maintained throughout the manufacturing process to insure that the coolant, including additives, in the delivered vehicle is equal to the coolant installed at the chassis OEM factory.

X. Fluids

Fluids shall be checked and filled from inside front hood where application allows. Engine oil fill/check, transmission oil fill/check, and coolant fill/check shall be located for easy access.

Y. Engine Cover

The engine cover shall be insulated from engine heat, engine and road noise.

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Driver's area noise level (at driver ear level) shall not exceed 82 DBA for diesel engine at a constant speed of 55 mph on a level roadway and shall be verified at pilot model inspection. Additional equipment added to the engine cover area shall not interfere with removal/installation of the engine cover.

Z. Exhaust System

Exhaust to exit rear of bus on street (left) side just forward of left end of rear bumper per FMVSS §393.83.

V. OTHER ITEMS

A. Safety

The following safety items shall be provided on each vehicle:

1. A 12 volt 97 db sealed solid state electronic warning alarm that is readily audible from outside the vehicle when transmission is in reverse. The alarm shall: be steam cleanable; have passed a 1 million cycle test; and meet SAE J994, OSHA, Bureau of Mines and all State Regulations. The alarm shall be mounted with bolts and properly grounded in a protected location in the rear axle area (location shall be approved by the State). Suggested source: Manufacturer's standard.
2. The rear door shall have an audible alarm at driver area that is energized when the rear door latch handle starts to open and when the rear door is locked with the ignition in the on or accessory position.
3. A lift master switch with light (green) at driver's station.
4. An indicator light (labeled) at driver's station that is activated when lift door is open and when the lift is in operation.
5. An interlock system shall be provided to ensure that the vehicle cannot be moved when the lift is not stowed and that the lift cannot be deployed unless the interlock is engaged (to meet ADA regulation). The interlock system shall engage when the lift operation sequence is followed. Interlock operating instructions shall be included with each bus at delivery.
6. An automatic daytime headlight control system shall be provided. The system shall illuminate the headlights when the ignition switch is on and the headlight switch is off. The system shall activate automatically after engine start up with the headlamp switch off and shall deactivate automatically when the headlamp switch is on or the ignition switch is turned off. Suggested source: See Me System by A&L Systems & Controls, Inc., or equal.

B. Electrical

1. Lift equipped buses shall have a circuit breaker with a manual reset in the lift feed circuit. The circuit breaker shall be installed near the battery in the positive power cable leading to the lift power pack.
2. All cable and wires shall be continuous color coded and numbered and the manufacturer shall furnish complete as built wiring diagrams with integrated body and chassis wiring marked to show the codes used. Mating harnesses and harness connectors shall use matching wiring and coding unless chassis OEM wiring and coding is different from body

manufacturer's.

3. The manufacturer shall install a master battery disconnect switch (rotary switch for easy access and positioned close to the driver's area) which shall disconnect the battery from the alternator and the complete electrical system excluding the passenger door fused constant power lead and a fused constant power lead for each electronic control units' long term memory. Location shall be approved by the State.
4. Electrical panels location shall be readily accessible. Circuit breakers shall be used on a master electrical panel. Highest quality components available shall be used. Two spare electrical fuses shall be supplied which match fuses used on the bus body and chassis and installed in a box at bus fuse box area.
5. All wiring added to chassis fuse block shall be securely fastened to prevent wires from being knocked loose by driver or vibration. Wiring shall be supported by "P" clamps or other supporting clamps where necessary and routed in separate hangers from heater hoses or air conditioning hoses. Body fuse/electrical panel shall be sufficiently sealed to prevent intrusion of dirt and moisture.
6. All wiring shall: be heavy-duty; be properly grounded to the body frame structure and the chassis; use a common grounding point; and be adequate for system electrical capacity.
7. All accessories and accessory electrical equipment shall be wired through a constant solenoid energized when the vehicle's ignition switch is in "ignition on" or "run" mode. A master switch with light in the driver's control panel shall control this constant solenoid and act as a quiet switch overriding individual switches for accessories. This master switch is wired in series with the ignition switch to control the constant solenoid. The constant solenoid shall not control headlights, taillights, emergency lights, charging system voltage regulator energizer lead, a fused power lead for the passenger door and a fused constant power lead for all electronic control units' long term memory.
8. All control switches used for the various circuits shall be properly marked for their function. The illuminated markings shall be a permanent part of the switch that does not wear off with use. Control switches shall be positioned for easy access.
9. All added wiring shall be installed in a split open-type loom and have a separate screw-type terminal circuit breaker system. All wiring harnesses shall have adequate length to allow for harness flexing where harnesses connect to electrical equipment from supporting brackets. Any added accessories or electrical circuits shall not interfere with or back-feed into other electrical circuits.
10. Wiring added from OEM chassis wiring to rear lights and/or gas tank shall be supported and protected from ice and snow build-up. Wiring shall be inside bus where possible. Wiring to taillights and other exterior lights shall be long enough to remove assembly by 6" for service. Exterior connections shall be weatherproof, positive lock connectors coated with dielectric grease (Weather-Pak or equal).
11. Scotch lock wire connectors or crimp style butt connectors are not acceptable and shall not be used for wiring installation. Terminals shall be as follows:

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- a. All interior connections shall be soldered and covered with heat shrink tubing when in a harness assembly. Harness assemblies shall have connectors matching a mating connector where harnesses attach to other harnesses, switches, or other electrical units.
 - b. All exterior wiring connectors (plug-ins) shall be weatherproof positive lock. Weather-Pak or equal.
12. **Two-Way Radio Antenna/Power** - All material and labor, except as noted, required to install two-way radio equipment shall be furnished by the manufacturer. Locations of components of this installation shall be determined at pilot model inspection.
- a. Two (2) antenna mounting plates (.060" steel minimum) shall be mounted in the roof of the coach for the purpose of providing a secure mount for the antenna. One plate shall be mounted forward of the front escape hatch on the roof center line, the second plate shall be mounted to the left of the first plate just above the coach side window. For vehicles with FRP composite bodies the mounting plates may be installed in the front cap of the vehicle.
 - b. Antenna ground planes, required for proper operation of antenna for systems from 42 megahertz (mhz) to 900 mhz, shall be mounted according to manufacturer's specification. Any ground plane shall be radio frequency (RF) grounded to the nearest metal portion of the body structure using high corrosion resistance and high conductivity braided ground straps of the proper size (**d**" minimum width).
 - c. Two screw-type access holes approximately 6" in diameter shall be installed at the antenna mounting plate locations, one centered in the interior ceiling and the second on the left side, above the side window line of the coach.
 - d. A concealed thin wall plastic conduit, 5/8" I.D. minimum, (with antenna cable pull wire) shall extend from the antenna mounting locations (roof and above side window) to the location for the radio. The conduit shall have no sharp or right angle bends and shall not be crushed during manufacturing process. For both antenna mounting locations sufficient space shall be left at each end of the conduit to allow easy removal and replacement of the devices attached to the cable.
 - e. 12-Volt Power for the Two-Way Radio - The positive lead (red) from the radio cable shall be connected to the 12-volt power bus. The positive lead (8 ga wire) shall be fused at 40 amperes. The ground lead (black, 8 ga) shall be connected directly to the chassis frame with a bolt and nut fastener. Proper suppression equipment shall be incorporated in the electrical system to eliminate interference with radio and television transmission and reception. The equipment shall not cause interference with any electronic system on the coach. 12-Volt Power for the Two-Way Radio - The positive lead (red) from the radio cable shall be connected to the 12-volt power busbar. The positive lead (8 ga wire) shall be fused at 30 amperes. The ground lead (black, 8 ga) shall be connected directly to the chassis frame.
 - f. The antenna pull wire and power leads shall terminate directly behind the driver's seat with 12 feet of extra length of power

leads.

- g. A split loom wire race-way (1" minimum) shall be installed from the radio location to the dash mounted microphone control location.
- h. The modesty panel behind the driver shall be used for radio mounting and shall be constructed to support 60 pounds of weight. A 5" minimum distance shall be provided between the driver's seat and the modesty panel when the driver's seat is in its most rearward travel position.

VI. ALTERNATE QUOTES (OPTIONS)

A. Air Conditioning system

- 1. The air conditioning system shall have front and rear air evaporator units. The system shall be integrated with a compatible in-dash driver's area evaporator unit (chassis OEM) capable of delivering tempered air for windshield defrosting. The system shall be of sufficient capacity to maintain interior temperature at 75°F at knee level throughout the bus when the outside temperature is 95°F during summer operation (from noon to 6 p.m. on sunny days, doors and windows closed). The system shall provide sufficient cooling ventilators for driver comfort. Front and rear air flow and temperature shall be controlled by switches on the driver's control panel or dash panel. See required certification in Vendor/Manufacturer Requirements, Section VII, C.

The air conditioning system shall be equal in quality, design, and performance to an A/C Industries Model AC-553, 52,000 BTU/hr system and above performance standards. The system shall use refrigerant type R-134A.

- 2. Compressor: Shall be one air conditioning compressor nominal 10 cu. in. displacement driven off the vehicle's engine. Hose end metal fittings connecting hoses to the compressor shall be OEM or electro-coated steel that will pass the ASTM D117 1000 hour salt spray test. A/C system pressure monitoring switches (cut out switches) shall be installed in the system to provide compressor protection from extreme high and extreme low pressures. The compressor clutch circuit shall be interrupted when abnormal pressures are detected by the pressure monitoring switches.
- 3. Condenser: The condenser system shall be skirt mounted. The condenser fans and motors shall be enclosed within the condenser housing. The housing shall be galvanealed with heat-fused powdered epoxy coating. The condenser coil shall be copper tube expanded into aluminum fins and vinyl-coated. Hose end metal fittings connecting hoses to the condenser shall be electro-coated steel that will pass the ASTM D117 1000 hour salt spray test. The condenser shall be equipped with 10" axial fans dynamically balanced with permanent magnet totally enclosed motors. The condenser shall blow air on an angle down from the bus chassis to prevent re-circulation of hot air. The drier shall be included and a sight glass where necessary. A winter protection system shall be approved by the State. The condenser shall include winter guard kits. Suggested source for winter guard kits: A.C. Industries model 010-112 or equal. Suggested source for condenser: A.C. Industries model CM-3 or equal.

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4. Evaporator

- a. The front and rear evaporator(s) shall have three-speed continuous duty permanently lubricated blower motors (blower assembly rated at 1985 CFM). Front evaporator may be Chassis OEM equipment, otherwise it shall meet requirements of rear evaporator. The rear evaporator core shall be a copper coil with aluminum fins (four rows deep), galvanized heavy-duty frame and coil end sheets with a galvanealed drain pan. The evaporator expansion valve shall have "O" ring refrigerant connections. Suggested source: A.C. model EM-1 or equal.
 - b. The driver's in-dash evaporator shall be controlled separately from the passenger area system and shall have a three-speed continuous duty permanently lubricated blower motor. Driver's in-dash unit shall operate without rear evaporator unit's fan in the on position. Air from the dash unit shall be able to be diverted to the windshield defrosters (tempered air). In-dash unit shall not interfere with removal or replacement of the engine cover or be blocked by the door control mechanism.
5. The passenger area air conditioning system shall be separately controlled from a control station at the driver's position. The controls shall include an on/off, three-speed blower switch.
 6. The components of the air conditioning system shall be readily accessible for maintenance. Service ports shall be accessible without removing any other component or item. The refrigerant hoses shall be double braided Freon-type, Goodyear Galaxy or equal with adequate extra length for flexing where connected to compressors and other components. Hose routing between components shall be as direct as possible with no sharp bends. Hoses shall be protected from abrasion by properly insulating the hoses from any sharp edges or material that can wear or cut the hoses. All refrigerant fittings shall be electro-coated steel that will pass the ASTM D117 1000 hour salt spray test. Refrigerant fittings shall be ATCO, Aeroquip, or equal.
 7. The wiring shall meet all applicable specifications (see Section V.B.). The evaporator and condenser wiring (power and ground circuits) shall be properly sized to provide full battery voltage to each electrical unit.
 8. Air conditioning circuits shall be protected with automatic circuit breakers or thermal relays.

B. Manual Entrance Door

1. The manufacturer shall provide a heavy duty manually-operated passenger entrance door with control handle located in the driver's compartment within easy reach of the driver. The passenger entrance door shall not extend below the step frame. The door shall be located on the right side of the vehicle behind the right front wheel. The entrance door shall provide a 30" clear width opening, minimum, with all handrails installed. Door opening height from the top of the first step to the door header shall be a minimum of 76".
2. Passenger entrance door shall be a double-folding, split-type double leaf swing door. This door shall have a flexible soft rubber cushion on the meeting edge 1½" in width, minimum. The door glass shall be see-

through, tinted (AS-2) safety glass. Under all operating conditions and vehicle speeds an airtight and dust-proof seal shall be formed between the door and the stepwell, between the door and body opening, and between the door leaf sections.

3. A method shall be provided to lock the bus when it is not in use.

C. Diesel Engine

The optional engine in the Diesel-powered drive train shall be an 8 cylinder (V-8 OHV) turbocharged diesel engine 6.5R minimum with a cold climate package. Chassis OEM electric, 110 volt, 1000 watt, engine block heater with cord and covered receptacle shall be required for all diesel engines. Driver's area noise level shall not exceed 82 decibels at a constant speed of 55 mph on a level roadway and shall be verified at pilot model inspection.

D. Auxiliary Heater System

1. All auxiliary heater systems provided shall be able to preheat, provide supplemental heat, and maintain heat for the interior of the bus for all engines. The auxiliary heater systems shall be supplied as a heated air model with an on/off, variable temperature control and as a heated coolant model with a seven-day electronic timer control. The seven-day timer control shall be capable of a two hour preheat, minimum and be capable of continuous run control when the key is on with the engine running. The system control units shall be located in the driver's area of the vehicle. The heater systems shall be complete with all fuel and electrical controls, exhaust system, and standard warranty. All heaters shall be 12 volt units with a fused power supply and with protection for high and low voltage conditions. The auxiliary heater system shall meet FMVSS 301 fuel system integrity requirements. The heating units shall be fueled by the vehicle's primary fuel supply--either gasoline or diesel. The electrical connection shall be a one piece harness from the control switch to the heating unit with weather-pak or equal exterior connections.
2. The heated coolant model shall be a self-contained unit mounted under the bus near the rear heating unit, and connected to the heater hoses leading to the rear heating unit. It shall be in an enclosure (similar to a battery box) with an access door from the exterior of the bus), be easily accessible for servicing, be weather resistant, and be complete with mounting brackets/hardware and coolant circulator pump. The heated coolant system units shall have as safety features temperature regulating and overheat shut down switches and include a seven day electronic timer to control operation. The coolant heater shall control coolant temperature between a low of 170°F and a high of 200°F with a heat output of 22,500 BTU/hr minimum. The auxiliary heater exhaust shall be connected to a section of rigid exhaust pipe with a down sweep that exits just beyond the body side. Suggested source: Espar Inc. B7W (gas, heated coolant) Webasto or equal; Espar Inc. D7W(diesel, heated coolant), Webasto DW80 (diesel, heated coolant), or equal.
3. The heated air model (with mounting brackets) shall be a self-contained unit placed in the passenger area either between the bus seat and bus floor or in a clear free space in the interior of the bus (placement shall be decided at the time of installation). The heated air system shall be a variable output, multi-stage heater for all engines. The heating unit shall have: 1) 16,000 BTU heat output, minimum (high heat setting): 2) 100 CFM of air delivery, minimum: 3) automatic cycling

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between heat output stages. The heating unit shall be operated from the vehicle driver's area control unit. The unit shall have automatic overheat protection. All heater systems' fuel and exhaust connections shall be made outside the passenger compartment of the bus. The auxiliary heater exhaust shall be connected to a section of rigid exhaust pipe with a down sweep that exits just beyond the body side. The heating unit shall be fueled from the vehicle's primary fuel supply--either gasoline or diesel. Suggested source: Espar Inc. D5L/B5L (diesel/gas, heated air) Webasto or equal. When an auxiliary air heater is installed on diesel models the engine shall be equipped with a 1000 watt 110-120 volt-A.C. OEM installed engine block heater with cord and covered receptacle. Engine block heater electrical cord receptacle shall be mounted for convenient access and protected from the weather (location to be determined at pilot model build).

E. Limited Slip Differential

The limited slip differential powers both rear wheels yet freely permits wheel speed differentiation when required. This prevents wheel spin and power loss when one wheel loses traction.

F. Destination Sign

A 12-volt destination sign with a motor driven movable sign curtain mechanism shall be provided which meets ADA requirements (one front sign and one side sign). The sign curtain shall be approximately 36" wide and illuminated. The sign box shall have a door to open for the operator to view the sign curtain position. The door shall be positioned for ease of driver operation. Suggested source: Trans Sign Model D-3110 or equal.

G. Engine Shutdown System

A warning/engine shutdown system for gasoline and diesel engines which shall be capable of monitoring oil pressure, engine temperature, and engine coolant level and which shall sound an alarm and shut down the engine when: 1) low oil pressure occurs;

2) high coolant temperature occurs; or 3) low coolant level occurs. The warning/engine shutdown system shall include an audible alarm (with warning light) and visual indicator lights (oil pres., eng temp., and the like) in the driver's area. The visual indicators lights shall be labeled to define the source of engine shutdown as a system diagnostic aid. The low coolant probe shall not be installed in the coolant overflow/recovery container. Suggested source: Murphy System or equal.

H. Donation Box

A donation box (to replace the farebox) shall be mounted on an adequately braced stanchion; shall be located over a flat floor surface near the driver; and shall be accessible to passengers entering bus (meet ADA requirements). The lockable donation box shall be supplied with two keys. (Location shall be approved by the State at pilot model inspection.) Suggested source: Main Farebox Model C91M or equal.

I. Rear Emergency Exit Window

1. Each bus shall be equipped with a rear exit window with a minimum of 1,200 square inches of glass area (opening 20" by 60", minimum). The rear window shall have latching device for opening from inside the bus

which may be quickly released but designed to offer protection against accidental release. Lever-type latches shall be used for rear emergency exit windows and shall secure the windows tightly shut, shall be easily operated, and shall not unlatch due to vibration during normal bus operation. The latches shall be made of non-corrosive materials and be designed for minimal maintenance needs. The rear window exit shall meet federal requirements (FMVSS 217). The rear window exit shall have an audible alarm at the driver's area energized when the window starts to open with the ignition on. A clear full width path of 16" minimum height shall be provided to the rear exit window. No objects shall be placed in bus which restricts passageway to rear exit window. All emergency exits shall be marked with instructions for proper use.

2. The bus rear exit window shall have a glue-on wide angle view Fresnel lens to improve vision directly in back of bus. Suggested source: Vanguard made by Optical Sciences Group or equal.

J. Rear Five Place Passenger Seat

On buses with a rear exit window, forward facing seating for five passengers shall replace two double place forward facing seats at the rear wall of the passenger compartment increasing the passenger capacity by one. The five passenger seating shall be available for buses with the lift forward of the rear axle (no wheelchair lift and/or securement location at the rear of the bus). The five passenger seat shall be 88" minimum width and shall comply with all requirements specified in Section II., Part P., Item 4. and Item 5. of these specifications but without grab handles. The seats shall be of the same design as the other passenger seats.

VII. VENDOR/MANUFACTURER REQUIREMENTS

- A. Vehicle Information Furnished** - All vehicle information in this section shall be reviewed at the pre-pilot meeting and at final pilot model inspection and supplied with the each bus at delivery where indicated.

1. Copy of manufacturer's statement of origin for a vehicle.
2. Warranty papers for chassis, body, and additional equipment with each bus at delivery.
3. As built drawings showing wiring schematics of all electrical circuits, body, and chassis with each bus at delivery.
4. Operator's manual for vehicle and all add-on equipment with each bus at delivery.
5. A complete set of repair manuals for the chassis and a manufacturer's parts manual for body, and auxiliary equipment for first bus of each model year delivered to each transit agency.
6. Bus operating instructions showing controls and operation on a VHS video cassette tape for the first bus delivered to each transit agency.
7. Standard manufacturer's production option sheet(s)/decals for chassis and body shall be installed in standard location, with no holes or rivets obscuring writing and numbers. Sheet shall include rear axle ratio. A paper copy of the service broadcast sheet for chassis shall also be provided with each vehicle at delivery.

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8. Maintenance and inspection schedule incorporating the required maintenance and inspection of the basic vehicle and its subsystems (i.e., wheelchair lift) with each bus at delivery.
9. Detailed description and specifications of the frame structure, roof structure, side sheathing, inside panels, with particular reference to material used.
10. Detailed drawing on how body structure is mounted on chassis frame.
11. Proof of vehicle suspension alignment (work order or bill) at final vehicle inspection and with each bus at delivery. Four wheel alignment shall include adjustments to front/rear suspension and steering parts so that axle alignment, camber, caster, and toe settings are within manufacturer's desired limits.
12. Proof of undercoating (warranty) at final vehicle inspection and with each bus at delivery.

B. Manufacturer Quality Control

Vehicle Contractor/manufacturer shall provide a plan for quality control during vehicle construction and include the plan as part of the bid documents. Vehicle Contractor/manufacturer shall also provide the name of the chief of quality control for vehicle construction.

The Contractor shall establish and maintain an effective in-plant quality assurance organization. It shall be a specifically defined organization and should be directly responsible to the Contractor's to management and completely independent from production. The quality assurance organization shall exercise quality control over all phases of production from initiation of design through manufacture and preparation for delivery. The organization shall also control the quality of supply articles. The quality assurance organization shall verify inspection operation instructions to ascertain that the manufactured product meets all prescribed requirements. The quality assurance organization shall detect and promptly assure correction of any conditions that may result in the production of defective transit vehicles. These conditions may occur in design, purchases, manufacture, tests or operations that culminate in defective supplies, services, facilities, technical data, or standards. The Contractor shall maintain drawings and other documentation that completely describe a qualified vehicle that meets all of the options and special requirements of this procurement. The quality assurance organization shall verify that each transit vehicle is manufactured in accordance with these controlled drawings and documentation.

The Contractor shall ensure that all basic production operations, as well as other processing and fabricating, are performed under controlled conditions. Establishment of these controlled conditions shall be based the documented work instructions, adequate production equipment, and special work environments if necessary. A system for final inspection and test of completed transit vehicles shall be provided by the quality assurance organization. It shall measure the overall quality of each completed vehicle. A system shall be maintained by the quality assurance organization for identifying the inspection status of components and completed transit vehicles. Identification may include cards, tags, or other normal quality control devices. Inspection stations shall be at the best locations to provide for the work content and characteristics to be inspected. Stations shall provide the facilities and equipment to inspect structural, electrical, hydraulic, and other components and assemblies for compliance with the design

requirements. Stations shall also be at the best locations to inspect or test characteristics before they are concealed by subsequent fabrication or assembly operations. These locations shall minimally include, as practicable, under-body structure completion, body framing completion, body prior to paint preparation, water test before interior trim and insulation installation, engine installation completion, under-body dress-up and completion, vehicle prior to final paint touch-up, vehicle prior to road test, vehicle final road completion and presentation to resident inspectors. Tests shall be performed by the vehicle manufacturer to ensure that the unit is dustproof, water-tight, fumeproof, and that all vehicle fluids are per specifications. The quality assurance organization shall be responsible for presenting the completed vehicle to the resident inspectors. Sufficiently trained inspectors shall be used to ensure that all materials, components, and assemblies are inspected for conformance with the qualified vehicle design.

The State may be represented at the Contractor's plant by resident inspectors. They shall monitor, in the contractor's plant, the manufacture of transit vehicles built under this procurement. The Contractor shall provide office space for the Resident Inspectors in close proximity to the final assembly area. This office space shall be equipped with desks, chairs, outside and interplant telephones, and other items sufficient to accommodate the Resident Inspector staff.

C. Air Conditioning Certification

1. Vehicle manufacturer shall provide air conditioning system performance certification (conducted by an independent laboratory or testing agency and supported by documentation of the actual test on the pilot model vehicle) that the air conditioning system installed in the vehicle meets or exceeds performance levels required by these specifications.
2. The air conditioning system performance testing shall be conducted using a heating chamber of sufficient size to contain the basic vehicle; to heat soak the vehicle at 100°F for 4 hours minimum; to simulate sun load entering windshield; and to maintain 100°F exterior temperature continuously after heat soak during testing. An interior temperature of 72°F ±3° must be reached within 30 minutes from the beginning of the test.
3. Instrumentation for temperature monitoring points shall be for the bus interior (minimum of 3 in passenger area and one in driver's area at knee level), the evaporator inlet and outlet, the condenser and ambient air. Compressor suction and discharge pressures shall be monitored during the test. Instrumentation equipment shall be able to monitor all temperature points and data shall be recorded at 30 second intervals with a data report generated from the test.

D. Purchaser Inspection

The purchaser reserves the right and shall be at liberty to inspect all material and workmanship at all times during the progress of the work, and shall have the right to reject all material and workmanship which do not conform with the specifications or accepted practice. Where a resident inspector is used, upon the request to the quality assurance supervisor, the resident inspectors shall have access to the Contractor's quality assurance files related to this procurement. These files shall include drawings, material standards, parts lists, inspection processing and records, and record of defects.

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E. Warranty

Warranty for the vehicle shall be the following as a minimum:

1. Three (3) years/36,000 miles on chassis.
2. Three (3) years/36,000 miles on transmission.
3. Three (3) years on body exterior and structure.
4. Eighteen (18) months on lift.
5. All wiring shall be warranted for 1 year from date of delivery.
6. Manufacturer's standard warranty, one (1) year 12,000 miles, minimum, on other add-on components and items.
7. Warranty shall start the date the vehicle is placed into service by the transit agency.

F. Miscellaneous

1. The vendor shall furnish the State with the delivery schedule of chassis to vendor and a delivery date of completed vehicles within 30 calendar days from date of order.
2. Any in-line equipment changes shall have prior written approval of the State.
3. The vendor shall supply the vehicle turning radius: wheel-to-wheel and wall-to-wall.
4. The vendor shall furnish warranty procedure instructions and necessary forms used for customers to obtain necessary warranty repairs.
5. The manufacturer(s) shall produce as pilot models the first two buses ordered by the State for its transit agencies. The buses shall be: 1) one on the contract for gas vehicles: 2) one on the contract for diesel vehicles: 3) each lift equipped: 4) each air conditioned: and 5) each the largest sizes on request by the transit agencies. All necessary testing and equipment placement shall be performed on the pilots before final inspection/acceptance by the State. The pilot models shall serve as a standard for the following units but shall not relieve the contractor from an obligation to manufacture all units in compliance with all specifications.

VIII. BID DOCUMENTS

The bidder shall supply two copies of the following with the bid quotation:

- A. A floor plan of the vehicle shall be provided indicating dimensions and showing the interior layout of the vehicle. The plan shall include wheelchair placement, stanchion locations, engineering calculated loaded vehicle axle weights, and be drawn to scale for all configurations.
- B. All bidders must supply Manufacturer's technical specifications for wheelchair lifts and wheelchair restraints. Manufacturer's sales literature is acceptable if it contains the technical specifications.
- C. Detailed engineering drawing for the design of the entrance door and

door opening device (with drawings).

- D. Detailed engineering drawing for the design of the entrance step configuration (with drawings).
- E. A description of the manufacturer's chassis, (specifications).
- F. The warranties for body, chassis, and drive train.
- G. A copy of the Bus Rollover Protection Test (FMVSS 220) results of the vehicle offered as specified in the bid.
- H. The required Federal Transit Administration (FTA) clauses shall be attached to bid quotation.
- I. The Michigan Bus Specification forms completed in detail.
- J. The technical data sheet including flammability and smoke emissions for the seat foam supplied.
- K. Seat frame salt spray, humidity and impact resistance and test results
- L. Certification test data that the seats, the seat belts, and the installation are in compliance with FMVSS-207, 208, 209, and 210 where applicable
- M. Roof, sidewall, and flooring drawings showing structure and structural specifications indicating metal size and type used. Include side sheathing and inside panels.
- N. Detailed engineering drawing on how body structure is mounted on chassis frame.
- O. Certification that the wiring and the switches for air conditioning and all add-on components are adequate to withstand transient loads expected.
- P. Certification that the bus model offered is a 4 year or 100,000 mile vehicle and will meet the requirements of Federal Register Rules and Regulations 49 CFR Part 665, Bus Testing Program. Stating from § 665.13 Test Report and Manufacturer Certification, Section (b)(1) "A manufacturer of a new bus model or a bus produced with a major change in component or configuration shall provide a copy of the test report to a recipient during the point in the procurement process specified by the recipient".

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IX. TABLE 1

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X. BUS SEATING ARRANGEMENTS

The 18-passenger non-lift bus and lift bus shall be supplied as requested in the following seating arrangements:

- A. 18 Passenger Bus without Lift
- B. 11+1 Passenger Bus with active lift forward of rear axle
- C. 10+2 Passenger Bus with active lift forward of rear axle
- D. 11+1 Passenger Bus with active lift behind rear axle
- E. 4+2 Passenger Bus with active lift behind rear axle
- F. 19 Passenger Bus w/o lift with five place rear seat option with rear exit window option
- G. 12+1 Passenger Bus with lift forward of rear axle with five place rear seat option with rear exit window option

Suggested floor plan drawings for each bus seating arrangement are as follows:

A. 18 Passenger without Lift

B. 11+1 Passenger Bus with active
lift forward of rear axle

C. 10+2 Passenger Bus with active
lift forward of rear axle

D. 11+1 Passenger Bus with active
lift behind rear axle

E. 4+2 Passenger Bus with active
lift behind rear axle

F. 19 Passenger w/o lift
With five place rear seat option
With rear exit window option

G. 12+1 Passenger with lift
forward of rear axle
With five place rear seat option
With rear exit window option

This specification was developed as a cooperative effort between the Michigan Department of Transportation and a committee of representatives from various Michigan Public Transit Agencies.

Upon request, this specification can be obtained in alternative format such as braille, large print, or audio tape. Contact Jerome Jonson, Michigan Department of Transportation, UPTRAN, at 517/335-2568.